Theorising variation in engagement in professional and curriculum development: performativity, capital, systems and purpose

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Theorising variation in engagement in professional and curriculum development: performativity, capital, systems and purpose

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Abstract

Increasingly, policymakers seek to improve the quality of teaching through curriculum innovations and continuing professional development (CPD) programmes. However, engagement by schools and teachers varies due to mediating influences of neoliberal policies. In this article, we contribute to understanding how these tendencies affect participation. Problematising the notion of context, we examine ways in which systemic influences interacted with participation in a government-funded mathematics professional and curriculum development programme and also with participants' purposes.

A 3-level clustered Randomised Controlled Trial (RCT) and an implementation and process evaluation were augmented by in-depth case studies, cross-case analysis and the application of theoretical constructs to interpret findings. Theories of capital, figured worlds and systemic coupling are utilised to theorise context.

Different levels of engagement are partly explainable by: the interaction of schools' relative systemic advantage and disadvantage; their orientation and coupling to performativity regimes; and the alignment or dissonance between continuing professional development or change programmes and the pedagogical and CPD cultures and purposes of the 'actors' (schools, departments and teachers). Performativity concerns restricted what were considered legitimate outcomes in some case study schools. This depended on teachers and schools' positioning in terms of relative degrees of systemic privilege or disadvantage - understood as economic, cultural, social and symbolic capital - and also in terms of figured worlds and system coupling. The case studies provide insights into how collaborative professional learning can be fostered more productively. Methodologically, we demonstrate the power of combining methodologies and applying explanatory social theory to augment quasi-experimental paradigms.

The focus

Increasingly, policymakers seek to improve the quality of teaching through curriculum innovations and professional development programmes. Underlying these approaches are notions such as 'evidence based teaching' and 'what works' (Wiseman, 2010), though the appropriateness and credibility of this paradigm is contested (Biesta, 2007, 2010). Nevertheless, school leaders and teachers make choices about investment of time, money and attention to changing practice including engagement in professional development to support change.

Within the innovation and implementation paradigm, for change projects involving teacher professional learning, a causal connection is posited between professional development activities, teacher engagement in them, changed practices and outcomes for learners. However, implementation and teachers' engagement in professional development activity can vary, influenced by the environment in which the activity takes place (Clarke and Hollingsworth, 2002; Desimone, 2009; Hoekstra, et al. 2009; Louws, et al. 2017 Opfer and Pedder, 2011). That such variation is likely to occur, and should be recorded, is recognised in implementation and process evaluation methodology. Important in this is the concept of fidelity (Durlak and DuPre, 2008; Humphrey et al. 2016), that is the extent to which a programme and/or innovation is implemented as designed.

A lack of understanding of why participation and engagement in professional development vary has implications for the design and context-appropriateness of professional development programmes. Furthermore, it is difficult to assess the effectiveness of innovative practices or materials when fidelity is low, so it is important to learn why and how programmes are implemented as intended.

Process evaluators do explore reasons for differences in fidelity between different educational sites or actors. For example, they may analyse the factors influencing variability in attendance at professional development events and in the use of innovative curriculum materials by teachers. However, in implementation and process evaluation methodologies, constructs of engagement and participation used are often those that are easily measurable, rather than embracing engagement and participation as complex constructs to be problematised.

Further, as we argue in this paper, typical implementation and process evaluation methodologies and data collection tools do not support fine-grained understanding of how actors' situations, purposes and systemic influences, and the interrelationships between these, mediate and shape different degrees of participation. Here we use 'actor' in a broad sense similar to usage in socio-material accounts of professional development where is not limited to human actors (e.g. Fenwick and Edwards, 2010).

The need for more complex understandings of influences on participation and engagement is heightened in the current neoliberal educational landscape of accountability systems, related performativity regimes and marketisation. Teachers and schools are positioned differently, in terms of relative privilege or disadvantage, in the systemic setting in which professional development is enacted. In England this is marked by the influence of neoliberal new public management ideologies (Arnott and Menter, 2007; Sugrue and Mertkan, 2016). Although English education is one of the more extreme examples (Greany and Waterhouse, 2016) of the 'Global Education Reform Movement' (Sahlberg, 2011), similar tendencies are found elsewhere (Sellar and Lingard, 2013; Zeichner, 2010). Thus, the claims and arguments we make in the paper are of wider relevance. However, this performative systemic environment, although pervasive, does not manifest in uniform ways in all schools, nor does it shape teachers' purposes or teachers' responses to performativity uniformly.

The central foci of the paper follow from the concerns so far outlined:

- the need to account for variation and engagement in participation;
- the limitations of RCT and implementation process evaluation methodology;
- the need to embrace more complex understandings of actors involved in innovation and their relationships;
- and specifically how the above issues manifest in the current performativity environment.

In the next section, we continue to introduce the paper's themes and further develop the central foci by discussing the genesis and rationale for the specific research questions.

Research questions: genesis and rationale

Our theoretical, methodological and practical concerns were prompted by efforts to understand the variation in teachers' participation and engagement found in an evaluation of a government-funded collaborative professional and curriculum development programme. The Multiplicative Reasoning Project (MRP) focused on mathematics education in England for 11-14 year-olds (Boylan, et al. 2015a, 2015b). A total of 60 teachers (two from each of 30 schools) participated in the MRP, with an equivalent number in the control condition. The original trial methodology consisted of a 3-level Randomised Controlled Trial (RCT) alongside an implementation and process evaluation (IPE). Embedded in the IPE was a multiple case study of nine of the 30 schools. However, for the purposes of this paper, one of the case studies was later discounted from analysis because it was, unusually, a 'middle' school for pupils aged 9-13. The multiple case study and cross-case analysis (Stake, 2013) used mixed methods. Whilst the IPE methods helped to develop a description of participation and engagement, we found the methods to be limited in their power to interpret the findings.

One plausible way to address this might have been to look beyond research focused on evidence, school and teacher effectiveness, toward the wider body of research on professional development. The latter uses alternative theoretical conceptions and methodologies better suited to understanding complex interactions of situation, systems, activities and purposes. Unfortunately, what is often referred to as 'context' is relatively neglected in the professional development literature, at least in terms of its theorisation in current analytical models (Boylan, et al. 2018). By 'analytical model' we mean an abstraction purporting to describe how professional learning occurs and which can be used for analysis of programmes or professional learning outcomes. Often research design and analytical tools do not fully account for this, with 'context' or 'environment' under-theorised. Context is often posited or discussed as akin to a container in which professional development takes place (Nespor, 2002). An alternative is to view situation and systems as dynamic features influenced by innovations and professional learning.

Actors' purposes are considered in some models of professional development, for example in the notion of 'salient outcomes' in the interconnected model of teacher professional growth (Clarke and Hollingsworth, 2002). The concept of salient outcomes recognises that what constitutes a desirable goal in terms of student outcomes is related to teaching purposes. However, as in the container metaphor, this is often seen as an ontologically separate phenomenon. One approach to addressing this is through a systems perspective on professional learning (Opfer and Pedder, 2011). A systems perspective provides potentially powerful conceptual tools that allow for theorisation of the embedded and interconnected nature of engagement in professional development. Such tools can theorise participants' orientations to the professional development system (activities, programme, instigators, facilitators and other actors) as well as other relevant systems. However, as we argue below, other theoretical constructs are needed alongside such systemic lenses.

Thus, to address these questions and explain the identified differences in participation and engagement, we undertook additional analysis drawing on the following theoretical constructs:

- schools' economic, cultural, social and symbolic capital that applies Bourdieu's conceptualisation of different forms of capital (Bourdieu, 1986) in seeking to understand the different positions of schools and leaders in response to structural reforms and increased competition both in England (Coldron, et al. 2014) and across Europe (Maroy and Van Zanten, 2009);
- figured worlds (Holland et al. 1998) that fuses the construct of 'habitus' with cultural-historical theories and so emphasise the power of mediation and meaning-making through discursive and narrative action exemplified in actors' purposes;

- systemic coupling (Orton and Weick, 1990) to interrogate the influence of different systems on participation and engagement.

We discuss these constructs below and argue why they are germane to our study and suitable for addressing our concerns.

Those familiar with the theories we draw on may have observed that we are using constructs that sit, arguably, in distinct paradigms with different ontological and epistemological commitments. Concepts of capital drawn from Bourdieu and ideas from figured worlds are potentially easier to bring together given that Bourdieu's work was one of the sources for the figured world theory. However, both these constructs appear to conceptualise the social world differently to systems theory's treatment of the social world. Moreover, as presented in more detail below, there are three research methodologies that underlie our analysis:

- an RCT and implementation and process evaluation (Humphrey et al. 2016);
- a mixed methods multiple case study (Stake, 2013);
- a social theoretical analysis similar to adaptive theory (Layder, 1998).

The paradigms usually associated with these methodologies are, respectively: post-positivism/realism; pragmatism; and, as applied here, an interplay between critical realist and socio-cultural perspectives.

As will become evident, we seek to utilise the RCT method not simply as a means to produce statistical generalisation, but rather we deploy selected theoretical constructs - capital, systemic coupling and figured worlds - to develop responses to a set of questions related to the situated nature of professional development innovations. Addressing the questions is well-served by an interplay between these constructs and the data analysis. This approach has wider applicability. It is akin to a triad of non-statistical approaches identified by Pawson and Tilley (1997, p.120) as analytic induction, logical generalisation and abstraction. Using these tools can contribute to knowledge by "a process in which we move from one specific empirical case to a general theory and back".

Where we differ from Pawson and Tilly is in our use of a range of theorisations rather than a single general theory, and in our process of interplay between theorisation and data. We do not move in a linear manner from data to theory to a different dataset; rather, the interplay is a cycle in which we reconsider the learning from a specific study in relation to our set of theorisations as a back-and-forth process of theoretical abstraction. Our approach in bringing together different paradigms and methodologies and moving between them can be understood as post-postperspectival (Jay, 2013). A rationale for this approach to evaluation has been summarised in this way:

> Our work is conducted in natural settings, where history and context matter, where human behavior traces complex patterns of influence and relationship, where what is meaningful to those in the setting is both phenomenological and structural, arising from both lived experiences and the societal institutions that frame and shape those experiences. Engaging this complexity requires not a privileging of just one way of knowing and valuing, but rather a marshalling of all of our ways of understanding in a framework that honors diversity and respects difference. (Greene, Benjamin and Goodyear, 2001, p.25).

We aim to address three questions.

The two principal empirical and theoretical questions we tackle in this paper are:

1. How do performativity and accountability regimes influence participation and engagement?
2. How do situation/situatedness, systemic influences and actors' purposes help account for variation in engagement and participation in professional development innovations?

In applying these different theories and methodologies, we also address a third question:

3. What are the affordances of combining mixed methods, implementation and process evaluation methods and social theory to interrogate the interplay of situatedness and systems, purpose and engagement and participation, particularly in relation to influences of performativity?

Structure and argument of the paper

Because of the multiple concerns - the interaction between empirical analysis, application of theory and methodology as well as the discussion of these - the overall structure of the paper does not follow the more conventional organisation of introduction, review, methodology, findings and discussion.

The previous two sections and this one together broadly constitute an introduction to the paper. The next part of the paper consists of three sections which encompass a discussion of literature most pertinent to the foci and to the broad theoretical framing of the study. In the first of the three sections, we develop the discussion of the current landscape of performativity as the grounding to the figure of the Multiplicative Reasoning Project. As well as broadly outlining analyses of neoliberalism in education, we also focus specifically on what is already known about how this influences professional learning, innovation and engagement internationally. The second section in the theoretical framing of the research is one in which we problematise the notion of 'context'. Thus

we consider the way in which this construct or its equivalents are considered in analytical models of teacher professional learning (Boylan, et al. 2018). In doing this, we point to what may be missing even from more flexible and complex framings such as those drawing on systemic thinking (Opfer and Pedder, 2011). In the third section, we outline the theoretical constructs deployed: capital, coupling (Orton and Weick, 1990) and orientation and purpose within figured worlds (Holland, et al. 1998).

To recap, these three sections are equivalent to a theoretical frame and literature review. We then turn to the research case discussing the MRP in more detail. We do this in two ways. Firstly, we describe the MRP in keeping with a form that aligns with implementation and process evaluation methodology. Secondly, we provide additional relevant background information which is sometimes missing from descriptions of innovations. In particular, we revisit themes from the discussion of performativity and examine how these currently relate to secondary school mathematics education. We then present and argue for the three-phase layered methodology, the methods used in each phase and the analytical approach. We also summarise the outcomes of the implementation and process evaluation and cross-case analysis in relation to variation in participation and engagement.

The latter part of the paper interweaves findings and discussion. We present analysis from case studies in relation to each of the theoretical constructs and we interpolate analysis of data from the sample from all teachers and schools involved in the MRP. As we move through these sections we progressively develop the argument that the different constructs used - capital, systemic coupling and figured worlds - are needed to explain different aspects of the phenomena under examination. For example, analysis of school capital helps to understand overall forms of participation for high and low capital schools. However, it is less helpful in understanding the variation amongst middle capital schools. The implications for empirical questions of design of professional learning interventions are then considered as are theoretical issues and methodological implications. As well as summarising key arguments made, in conclusion we also consider the tensions between different policy tendencies in relation to school and teacher innovation.

Marketisation, performativity regimes and professional learning

Currently, in England, the systemic setting in which professional development is enacted is marked by the influence of neoliberal new public management ideologies (Arnott and Menter, 2007; Surgue and Mertkan, 2016). Arguably, English education can be seen as one of the more extreme examples (Greany and Waterhouse, 2016) of the 'Global Education Reform Movement' (Sahlberg, 2011). However, similar tendencies are found elsewhere (Sellar and Lingard, 2013; Zeichner, 2010),

including in Europe the tendency to reinforce or augment hierarchies of schools (Altrichter, Heinrich and Soukup-Altrichter, 2014; Maroy and Van Zentan, 2009).

Two contrasting but connected tendencies shape teachers' engagement with professional development. The first of these is the tendency towards quasi-marketisation in education (Ball, 2003, 2008); the second is the predominance of performativity regimes and accountability systems (Ball, 2000, 2003). These systems are used partly in order to regulate the quasi-market. How these tendencies manifest internationally varies according to local conditions, but nevertheless they have been identified in the United States (Zeichner, 2010), Australia (Sachs, 2003; Groundwater Smith and Mockler, 2009) and Europe (Altrichter, Heinrich and Soukup-Altrichter, 2014; Maroy and Van Zanten 2009).

In England, increased scrutiny by, and accountability to, government are used as levers to impact on school practice (Perryman, 2009; West, Mattei and Roberts, 2011). This is in effect a centralisation of control (Wilkinson, 2006; Woods and Simkins, 2014). An important aspect of the accountability regimes in England is regulation through inspection (Boyne et al., 2002). The Office for Standards in Education (Ofsted), the schools' inspectorate in England, makes judgements about schools which have high stakes implications for schools (Ofsted, 2016). Sanctions including change of leadership and governance may follow if a school is judged as 'inadequate' or not to have improved following a grade of 'requires improvement'. Schools judged inadequate may be placed in 'special measures'. Schools judged 'outstanding', however, have the opportunity to sponsor other schools that are performing less well (and so lead multi-academy trusts (Simkins, 2015)) or to access resources to lead professional development initiatives (Coldron, et al. 2014; Moreton, Boylan and Simkins, 2017) or to sell services to other schools such as school improvement. Performativity, arguably, dominates teachers' lives, as teachers and schools seek to meet accountability requirements (Ball, 2003; Perryman, 2009).

Performativity has become so pervasive that some ways of acting when under scrutiny - fabrication - become the normal way of thinking and acting beyond the formal periods of inspection and scrutiny. This phenomenon is referred to as post-fabrication (Clapham, 2015). One argument for greater school autonomy and marketisation is to promote innovation. However, in practice the new policy environment appears to lead to self-imposed constraints in this regard (Greany and Waterhouse, 2016) with the pressure of performativity tending to mitigate against innovation.

Thus, performativity regimes shape discourses of professional learning. Engagement in development activities by individual teachers and by schools is often constructed through discourses of accountability (Sugrue and Mertkan, 2016) that restrict and regulate professional development

possibilities (Pedder and Opfer, 2011). This is notwithstanding the promotion of forms of professional learning in which teachers are expected to take increasing responsibility for their own development (Boylan, 2018; Coolahan, 2002).

Performativity regimes also increase the number of actors involved in funding, promoting or offering professional development within the quasi-market. Professional development priorities are increasingly centralised, influenced by direct and mediated policy, but paradoxically there is also greater localisation of initiatives (Altrichter, Heinrich and Soukup-Altrichter, 2014). The market, the centralising and localising forces and the hierarchies all influence patterns of professional development programmes in England as part of what is referred to as a school-led system (Hargreaves, 2011; Husbands, 2015). Whilst it is apparent that these forces shape the capacity of schools to engage in and lead innovations and professional development, the mechanisms and the effects are under-researched. The contribution of the study presented here helps to address this gap.

Problematising 'context' in professional learning research

We continue the theoretical framing of the research in this section, by problematising the concept of 'context', particularly where it is understood using the container metaphor (Nespor, 2002). We then turn to the way in which the construct or its equivalents are considered in analytical models of teacher professional learning (Boylan, et al. 2018) and so we identify what may be missing even from more flexible and complex framings such as those drawing on systemic thinking (Opfer and Pedder, 2011). This leads to discussion of systemic perspectives (Opfer and Pedder, 2011) with consideration of the concepts of nested systems and orientation to professional development activities. We go on to argue that in systemic accounts too, the influence of whole-system features are not fully considered as yet; currently in England these are predominantly neoliberal regimes. Nor has the strength of systemic connections between local school systems and whole-system features been accounted for, along with how these influence teacher and school leader responses.

Much research on professional learning explicitly draws on what we refer to as the path model evaluation tradition (for example, Guskey, 1999; Desimone, 2009). Arguably, even when path models are not explicitly stated in professional learning design or policy, the logic is implicit. Within such literature, context is discussed as a set of factors that may influence the likelihood of professional learning activity leading to outcomes. These factors are analytically distinguished from the workings of the activity. Such models - exemplified by Guskey's work in evaluation (1999) and teacher change (2002) - focus their efforts on laying out potential causal pathways between the activity and outcomes. So, drawing on another example from within this tradition, Desimone (2009)

sets out features of professional development activity and presents a path model from these features via increased teacher knowledge, skills, attitudes and beliefs and changes in their instruction, and ultimately to improved student learning. Both Guskey and Desimone model the professional learning that arises from professional development activities as a linear process, although both acknowledge that influences can be reciprocal, for example between changes in teacher knowledge and changes in practice (Desimone, 2009). Clarke and Hollingsworth (2002 offer a model with multiple pathways. However, in their model (as in others) although reference is made to the school environment being important, this is viewed as distinct from other categories.

Whilst context is acknowledged to be important in these models and it can be described in relatively sophisticated ways, we argue that analytically it is treated as 'held steady' in the same way that economists describe models as *ceteris paribus* - all else is held equal. Another way of understanding context in these accounts is to view it metaphorically as a container (Nespor, 2002); this accords with the analytical separation of environment and other actors in professional learning.

An alternative way to address issues of context is to utilise systems theory (Opfer and Pedder, 2011; Taylor, 2017). Opfer and Pedder's (2011) systemic perspective suggests that professional learning and teaching have "both contextualized and decontextualized properties" (p.394). Important to contextualising professional learning is to consider a dynamic and mutually influencing set of nested systems including: the teacher, the school and the learning activity system, where the latter is the professional development initiative, programme or stimulus. Important too is the teacher's orientation to the learning activity system.

The nested systems and teacher orientations interact in different ways and with different intensities to influence teacher learning (see Boylan, et al. 2018 for further discussion). In the MRP analysis, another significant system is found - the department. The department was both an influence for enactment and potentially an object for professional development activity. The involvement of the department as a potential object for activity and so for change may be generally a feature of school-based professional learning and innovation. However, it was particularly important in the MRP because the original intention was for teachers participating in the professional development to involve and potentially lead professional learning in the department.

Opfer and Pedder's (2011) systemic approach has the potential to provide an account of professional learning that treats context in a way that values specificity but allows for comparability. By comparability we mean the possibility of identifying patterns and mechanisms that influence engagement and learning, albeit in ways that may not be predictable or replicable in a simplified way.

However, in our view, Opfer and Pedder's use of the concepts of nested systems and orientation to activity systems needs augmenting in order to operationalise a systemic perspective in researching professional learning. Their system model identifies two important 'orientations' - the teacher orientation and the school-level orientation to the learning activity being examined. Also important in their account is the interaction between these two orientations. As with the path models discussed above, the system model does not fully account for the influence of discourses, ideologies and forces that are hegemonic or pervasive in the whole educational system, since they underlie teacher and school orientations. Furthermore and as discussed in the previous section, in England (and elsewhere) these whole-system factors include the manifestation of neoliberal ideology at a structural level that impacts on schools and teachers in myriad ways.

The importance of influential interconnections in complex school ecologies in relation to these wider systemic features and their relationships to teacher and school orientations is underplayed. These interconnections operate within local systems beyond the school - both formally and informally - with varying degrees of strength of systemic coupling. This is a particular feature of the English school-led system (Hargreaves, 2011) with its ecology of multi-academy chains, Teaching School Alliances and forms of networks and shared governance.

Theorising variation in participation and engagement in professional learning

Having considered and problematised ‘context’ we now outline theoretical constructs that we embrace to address these issues and to theorise variation in participation and engagement in professional learning. These are:

- constructs of school capital (Coldron, et al. 2014);
- orientation and purpose within figured worlds (Holland, et al. 1998);
- systemic coupling (Orton and Weick, 1990).

In this section, these theoretical constructs are introduced. In the later analysis, all three constructs - school position and capital, the concept of figured world and coupling in nested systems - are deployed to understand variation in engagement of teachers in the MRP. Further exemplification and analysis are provided in the discussion of theoretical implications later in the paper.

School capital

The importance of the hierarchical positioning of schools was salient when analysing the relationship between participant teachers' school situations and their engagement with the MRP. Thus far, we

have generally discussed school positioning in terms of systemic advantage, disadvantage and an intermediate position. In this section, we provide a theoretical ground for understanding why this hierarchy occurs and also how it influences teachers' logic of action (van Zanten 2009) in relation to the MRP. To explain structural issues of differences between schools is to draw on Bourdieu's concepts of different forms of capital (Bourdieu 1986; 1989) and specifically economic, social, cultural and symbolic capital.

Before outlining how we use these concepts, we make three cautionary notes which also serve to position our stance on school capital. Firstly, Bourdieu's theory of different types of capital, or more properly his augmentation of the notion of economic capital found in Marx, was developed in relation to analysis of the positions, status, opportunity and power of individuals. In extending this analysis to consider the capital of schools as entities, there is potentially a risk of circular logic (Portes, 1998). For example, the cultural capital of schools may be explained by the cultural capital of individuals who constitute the school; in turn, the cultural capital of the school partly explains the cultural capital of those people affiliated to the school. However, in relation to the MRP the concept of capital is used as a partial explanation of the practices or actions of participants. Thus, we contend that the risk of tautology is avoided.

Concepts of social, cultural and symbolic capital extend or supplement the concept of economic capital. In a quasi-market situation, discussion of schools' economic capital is very pertinent. Thus, the extension to consider different schools' capital or capitals is justifiable. Recently, Bourdieu's construct of capital has been extended successfully by Coldron, et al. (2014) to understand school and headteacher positioning.

The second caution is that the construct of school capital has previously been applied as an extension of the concept of social capital found in Coleman (1990) and Putnam (2001). For these two theorists, the notion of social capital enhances social life but in a relatively apolitical way. This contrasts with Bourdieu's critical conception (Grenfall, 2010). Examples of the extension of this meaning of social capital to schools are found in New Labour education policy such as educational action zones (Gewirtz, et al. 2005). Further, even within the bodies of work by scholars drawing on Bourdieu's notion of capital, more or less critical versions may be found. Williams and Choudry (2016) note, for example, that one concept of cultural capital posits it as something that can be redistributed whereas a more critical treatment analyses the way in which such capital is intrinsic to processes of social reproduction. This is the position we take in this paper. The legitimacy of extending concepts of capital to schools is returned to in the discussion of theoretical implications towards the end of the paper.

As noted, four forms of capital appear relevant and specific to issues of professional learning and engagement in innovation. These are now briefly outlined in turn.

Economic capital

Ostensibly, schools in England are funded according to formulae which accord similar incomes to schools of similar sizes. However, some schools are able to gain access to additional financial resources for example, 'converter' academies (Coldron et al. 2014, and see Courtney, 2015). Further, advantaged schools are more likely to be sellers of services to other schools (for example, professional development) and disadvantaged schools more likely to be purchasers of such support (Greany and Higham, 2018). Human capital, as one aspect of economic capital, is evidenced in staffing. In secondary mathematics, this includes staffing by specialist mathematics teachers. Staffing also influences the capacity to release teaches to engage in professional development. Human capital also includes the capacity of senior leaders and teachers to lead professional development – these levels are recognised internationally as important in school-based professional development (see; Stoll, 2015). Pupils represent another form of economic capital. Here, contradictory tendencies can be found. On the one hand, for example, having low numbers of pupils receiving Free School Meals (FSM) is a marker of intake from relatively affluent homes and so is likely to lead to higher attainment outcomes and therefore make the school more desirable to parents. Further, secondary schools with low numbers of FSM pupils are disproportionately more likely to be judged 'outstanding', even when actual numbers of pupils in receipt of FSM are accounted for in statistical models (Hutchinson, 2016). On the other hand, pupils in receipt of FSM currently attract a 'pupil premium' - an additional payment to schools.

Cultural capital

In considering the capital of individuals, Bourdieu (1986) distinguishes between embodied, objectified and institutionalised cultural capital. The latter construct subsequently informed the positing of symbolic capital (see below). In relation to teacher professional development, embodied cultural capital may arise from a history of individual and collective engagement in previous innovations and professional development. This might be assessed, for example, by the extent to which the principles of professional learning communities are embedded (Stoll, et al. 2006). Objectified capital for individuals would constitute cultural goods such as books and tools. Although this may initially appear less relevant to professional development, it is notable that one advantaged school discussed in this article - *Hawthorn* - had a dedicated room for professional development and training in an annexe separate from the main school.

Social capital

Bourdieu identified that an important mechanism in social reproduction is found in the networks of relationships that both confer and maintain membership of a group as well as giving access to resources. In relation to professional development, examples of social capital are school networks such as Teaching School Alliances, and relationships to other actors in professional learning innovations, for example higher education institutions or, in the case of the MRP, the National Centre for Excellence in Teaching Mathematics (NCETM).

Symbolic capital

School designations such as Teaching School, Ofsted grading and league table position can bring additional resources directly (e.g. through Teaching School status) or indirectly by providing a competitive edge in markets for initial teacher education or leading professional development. The Ofsted rating provides symbolic capital which in a quasi-market influences school recruitment (Coldron, Cripps and Shipton, 2010) and therefore school income. Ofsted grade is also associated with ease of teacher recruitment (NAHT, 2016) and levels of retention (Sims, 2016). Further, as noted above, the number of pupils with FSM appears to indirectly influence Ofsted grades. Schools with high numbers of FSM pupils more likely to be judged inadequate even when results are accounted for (Hutchinson, 2016). Disadvantaged schools have lower capital, less secure staffing bases and are more subject to performativity pressures. So rather than having symbolic capital, they may experience 'symbolic violence' when designated as 'requiring improvement' or merely 'satisfactory'.

Clearly, these capitals are interrelated and mutually supportive. As indicated, they can be converted for one another - this is in keeping with Bourdieu's theory in relation to personal capital (Bourdieu, 1986). Bourdieu's theory of different forms of capital was developed precisely to understand social stratification into classes, and we draw on his classification approach to operationalise the interrelatedness between forms of capital by classifying schools as having high, middle and low capital which in turn are related to positions within hierarchies. All of these positions are precarious to varying degrees; even schools designated 'outstanding' may fear the loss of that status (Coldron, et al. 2014) although this is mitigated because such schools are subject to much lower levels of surveillance and less frequent inspections than other schools (Moreton, Boylan and Simkins, 2017).

Figured worlds

Coldron et al. (2014) augment their conceptualisation of capitals in their study of school and headteacher positions, with another Bourdieusian concept - habitus - to analyse the ways that

differently positioned headteachers perceive their position and the field in which they are located and their actions within this. This approach has potential to address these issues of local variation.

However, we take a different approach using instead the concept of figured worlds (Holland et al. 1998.). 'Figured worlds' fuses the construct of habitus with cultural-historical theories that emphasise the power of mediation and meaning-making through discursive and narrative action. The theory of figured worlds seeks to overcome perceived shortcomings in Bourdieu's formulations - a lack of attention to the local and the possibility of agency (Choudry and Williams, 2017). A figured world is a:

> socially and culturally constructed realm of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others (Holland, et al. 1998 p.52).

In educational research and theory, the concept of figured world has been primarily used to consider learners' identities and practices, with this extended to those learning to teach. However, the theory has also informed analysis of teachers' responses to curriculum innovation and accountability mechanisms (see Buchanan, 2015; McCarthey and Woodward, 2018).

The theory of figured worlds is potentially powerful in considering actors' purposes and their interpretation and translation of professional development stimuli in relation to these purposes. The construct of figured worlds allows for conceptualising multiple, intersecting and overlaid figured worlds and identifies how purposes of actors and systems variously align or conflict with those of the professional development innovation, such as the MRP.

Systemic coupling

The third conceptual addition we propose concerns the degree of systemic coupling. Here, relations between different systems can be described as loose to tight. The concept of coupling (Orton and Weick, 1990) is adapted to figure the relationships and degree of influence between systems. Introducing the concept of coupling helps to address the under-theorisation of how the different nested systems interrelate in Opfer and Pedder's (2011) outline systemic perspective. The nested systems relevant to the analysis include the whole-system level and the departmental system, as well as the relationship between participating teachers and, in some cases, the relationship to other actors beyond the project.

Although there is a risk of oversimplifying complex relationships into a binary category we utilise two forms of coupling: 'loosely coupled' and 'more closely coupled'. The use of 'more' is to convey that these categories are relative.

'Loose coupling' has been defined variously in terms of having few shared elements or showing a degree of responsiveness but with distinct identity. The meaning we adopt here draws on Weick (1982, cited in Orton and Weick 1990, p.203) and is summarised as relations that are:

- sudden (rather than continuous)
- occasional (rather than constant)
- negligible (rather than significant)
- indirect (rather than direct), and
- eventual (rather than immediate).

'More closely coupled' relations, therefore, suggest some or all of:

- many common elements within systems
- merged identity
- continuous, constant, direct
- immediate influences.

The concept of loose coupling has been previously applied to consider departmental and school relationships that influence professional experiences of learning and agency. In analysing teacher professional development in departments, de Lima (2007) argues that models of school improvement and professional learning do not give sufficient attention to schools as loosely coupled systems. He also provides evidence that attention needs to be paid to relationships between teachers and how these can provide affordances and limits for professional learning. Edwards et al. (2017) also focus on the importance of relationships, in their case interprofessional relationships between school-embedded psychologists and social workers and teachers. Their analysis indicated that the degree and form of coupling in the school contexts influenced relationships and opportunities for the development of agency. However, this study indicates that the concept of coupling, whilst analytically fruitful, by itself is not predictive of variation in practices. In this paper, we extend these applications of theories of systemic coupling to analyse relationships to innovation, participation and engagement.

The Multiplicative Reasoning Project

In this section, we discuss the Multiplicative Reasoning Project. We have reported the project design and activities in more detail elsewhere, as well as details of the evaluation and its outcomes (Boylan et al. 2015a; Boylan et al. 2015b) and we draw on those reports here. Initially we describe the MRP following a format that (loosely) aligns with a systematic approach for describing interventions - the TiDier framework (Hoffman et al. 2014). We then revisit themes from the discussion of

performativity and examine how these related specifically to secondary school mathematics education. This provides the sort of contextual background that is sometimes missing from descriptions of innovations.

Project description

The Multiplicative Reasoning Project was commissioned and funded by the English government's Department for Education (DfE). The curriculum and professional development project sought to address perceived weaknesses in mathematics teaching of 11-14 year-old students (English Key Stage 3). The project was led by The National Centre for Excellence in Teaching Mathematics, a government-funded organisation charged with enhancing mathematics teacher professional development, but an operationally independent organisation.

The MRP focused on developing teachers' understanding and capacity to teach topics that involved multiplicative reasoning to Key Stage 3 pupils. Proportional and fractional relationships were the areas addressed. The teaching approaches that were encouraged involved the use of mathematical models, visual supports and problem-solving strategies.

Thirty secondary schools took part in the MRP as the intervention sample, with the same number of schools in the control group. From each school, two mathematics teachers who taught Year 7, 8 and 9 pupils (aged 11-14) were nominated to attend the MRP professional development programme. These teachers were then encouraged to use the materials and adopt the principles of multiplicative reasoning with their Year 7, 8 and 9 pupils. The teachers were designated as 'core teachers', signalling that the project aimed to influence their departments more widely.

Curriculum developers designed project materials drawing on three different curriculum design traditions and working in three teams, though also collaborating with each other. In addition to using these materials, teachers were encouraged to engage in lesson study in school and other collaborative professional learning activities. Lesson study is a form of professional development, originating in Japan, in which groups of teachers engage in cycles of designing 'research lessons', observation and reflection (Lewis, Perry and Murata, 2006). Materials were organised into 'lessons' and 'units'. Each lesson could take two to three hours of teaching time. Thus, approximately 36 to 54 hours' worth of high quality research-informed curriculum materials were produced.

The core teachers engaged in one of three regional professional development networks led by professional development leaders supported by university researchers. Each network was referred to as a TIME network - 'Teachers Improving Mathematics Education'. Thus, a CPD event was called a TIME meeting. Five professional development events each involving six days of CPD (totalling 40 hours in a single year) took place. At these events, project materials were shared and explained.

Teachers used the materials with the intervention group of pupils in the normal class timetable. Potentially, MRP lessons could have been taught to all 4,367 pupils (at baseline) clustered into 182 Year 7, Year 8 and Year 9 mathematics classes. However, in practice, although core teachers were encouraged to use as many of the materials as possible, they were also advised to use their judgement about which aspects were appropriate or not with a given class in order to encourage a sense of ownership.

The overall intervention design can be characterised as curriculum design professional learning (Boylan and Demack, in publication) in which professional learning may occur both directly through activities designated as CPD and also through use of curriculum materials. The project's original aims included teachers leading change in the mathematics department, though this was not strongly emphasised in CPD events observed or in the tasks teachers were encouraged to carry out between events.

Situating the project

Beyond the organisational details, it is important to highlight the nature of the MRP in terms of its approach to mathematics teaching and learning and the organisation of professional development activity. It has long been recognised that mathematics teaching in schools in England is often marked by an instrumentalist approach in which mathematics is decontextualised and entails a mode of learning based on teacher explanation and practice (see, for example, Boaler, 1997; Boylan, 2010). The MRP sought to foster an approach based on conceptual understanding, the use of models and a problem-solving ethos. Thus, the approach was different to existing practices in many of the schools involved.

The design and conduct of the MRP was influenced by the tendencies towards marketisation and competition in England discussed earlier. One aspect of this is the transfer of responsibility for systemic improvement to some school leaders and schools - a facet of the school-led system (Hargreaves, 2011). In England, historically, schools that are systemically privileged are designated a role in system improvement including leading professional development. Designation of ‘Beacon Schools’ (Higham, Hopkins and Matthews, 2009) is an earlier example of this interaction between systemic privilege and additional responsibility and power . More recently a network of Teaching Schools has been established (Husbands, 2015). Teaching Schools lead local networks of schools and are charged with key roles in initial teacher education, leading professional development, supporting leadership in other schools, research and development, and school improvement (NCSL, 2012).

Another expression of this principle, and one particularly pertinent to this paper, has been the establishment of a Maths Hub network, with each Maths Hub led by a Teaching School. In the MRP,

the schools who hosted professional development and provided professional development leaders who led PD events were the pilot schools for the Maths Hubs initiative. Another feature of the complex landscape in England is the existence of various government-funded bodies that provide a more direct conduit for policy enactments. In the case of the MRP, one such body - the National Centre for Excellence in Teaching Mathematics - developed and led the project.

Methodology

In this section we present the three-phase layered methodology, the methods used in each phase and the analytical approach. We begin with methodology: firstly, the use of a Randomised Controlled Trial (RCT) and implementation and process evaluation (IPE); secondly, a mixed methods multiple case study; and finally a social theoretical analysis. We then describe the later analytical interpolation and discuss ethical issues and their relation to how we present data.

RCT and implementation and process evaluation

The impact of the MRP on pupil outcomes was evaluated using a 3-level Clustered Randomised Controlled Trial research design. Details of the trial methodology, statistical analyses and the accompanying process evaluation are provided elsewhere (Boylan et al. 2015a, 2015b). The trial ran between October 2013 and June 2014 and involved 8,777 Year 7, Year 8 and Year 9 pupils (level 1) clustered into 418 Year 7, Year 8 and Year 9 mathematics classes (level 2) clustered into 60 secondary schools. Approximately half the schools, teachers and pupils participated in the intervention and half formed a control group. Progress was compared between the two groups of pupils using national assessment data for pupils at the end of Year 6 as a baseline and the GL Assessment Progress in Mathematics Test (PiM) tests as an outcome measure. The latter is a measure of general mathematical attainment that is correlated with national tests. No impact of the intervention was found, including in relation to a sub-sample of schools that had shown a minimum threshold level of implementation when compared with the control sample. However, schools which had relatively high levels of implementation had more positive outcomes than those that did not within the intervention sample (see below).

The IPE was conducted in a similar way to guidance from the Education Endowment Fund (EEF) for process evaluations (see Humphrey et al. 2016). Briefly, the IPE collected and analysed data on the practical implementation of the intervention including factors that influenced implementation. Data were collected at four levels: national, regional, school and teacher level, and using a range of mixed methods. In addition to the case study data (the main data source discussed here), data were gathered on the participation and engagement of all schools involved. The IPE included the collection of attendance data at professional development events, surveys of participant teachers

following professional development events to record the use of curriculum materials, as well as observations of professional development events and other events.

A macro view of fidelity was adopted, exploring the extent to which the intervention was delivered as intended by the developers and considering other aspects including exposure (i.e. use of materials, participation in professional development) and response (teacher and pupil) (Humphrey et al. 2016). Fidelity of teacher engagement focused on the behaviour of core teachers in the intervention group.

Case study methodology

The main dataset analysed for this paper comprises eight of nine case studies, involving three schools from each region. Data from one school in the sample (the ninth case study) were excluded because it was a 'middle school' (students 9-13 years old) rather than a secondary school (11-16 or 11-18 years old) and therefore untypical. This school was also potentially identifiable, so ethical reasons were additional grounds for excluding from reporting here. It is important to note that the case study sample was potentially skewed and not fully representative. Although the original sampling matrix reflected schools with a variety of levels of engagement and socio-economic contexts, this did not lead to recruitment of the required number of schools. (Schools either failed to reply or declined to participate, for a variety of reasons.) However, as can be seen from Table 4 below, the sample represents a spectrum of levels of attendance and use of materials.

The case studies were conducted with the aim of understanding the implementation of the MRP as situated in the individual schools. During the evaluators' visits, a range of activities was carried out:

- Interviews with the core teachers (those attending professional development days) - ideally separately, but together if that was more convenient (30-60 minutes);
- Interview with the head of mathematics or equivalent (20-30 minutes);
- Interview with another teacher involved in lesson study or who had also used the materials or had attended a CPD session delivered by the core teachers (20-30 minutes).

Additional activities that took place in some schools were:

- Interview with a senior leader (15-30 minutes);
- One or more focus groups with pupils if they had recently used some of the materials.

Table 1 below gives details of case study schools and data collected, in addition to information collected at professional development events concerning attendance, material use and attitude to the project.

Table 1: Data sources for case studies

School/case	Interview data			Number of pupil focus groups
	Number of core teachers + other teachers	Head of department	Senior lead/head teacher	
Beech	2	1	1	1
Chestnut	2	1	0	1
Elder	2	1	0	1
Hawthorn	2+ 1 [trainee]	1	1	2
Maple	1	1	1	1
Scots Pine	1	1	0	1
Sycamore	2 + 1	1	1	1
Walnut	2 + 1	1	0	0
Total	**17**	**8**	**4**	**8**

Interviews were audio-recorded and later transcribed by a professional transcriber bound by a confidentiality agreement. From the interviews, an extended case report (approximately 4000 words) was prepared for each case study. We then prepared an analytical frame/code book related to different relevant themes developed inductively. Following this process, one researcher re-coded each case report, making revisions to the coding frame as appropriate.

Social theoretical analysis

As stated above, analysis of data was informed by constructs from social theory and we return to these here. To address the differences we found in participation, we undertook additional analysis drawing on the following theoretical constructs: (i) theorisation of schools' economic, cultural, social and symbolic capital; (ii) figured worlds (Holland et al. 1998) as a means to operationalise the concept of system orientation (Opfer and Pedder, 2011), extended to consider the teachers' and schools' orientation to wider system relationships; and (iii) systemic coupling (Orton and Weick, 1990) - in this this case coupling to the department as the immediate site of implementation and to the English performativity system. From these analytical constructs, codes were developed and informed analysis. These codes related to:

- issues of school capital and their influence and manifestation at a departmental level;
- school, departmental and teacher practices, culture and purposes;
- the school's, department's and teacher's positions in relationship to the nested systems, including the external systems (for example, the accountability regime, external networks);
- the school and professional learning systems; and
- the degree of coupling between the different systems.

This process led to further coding of the case studies.

Mixed methods interpolation

In addition to the above analysis, quantitative data on participation and engagement were further reviewed to analyse patterns in engagement and explore different approaches to quantifying participation and engagement (see below). These processes were interspersed with both formal and informal analysis meetings where the research team reviewed the outcomes of this process and further refined the codes leading to further analysis. The final phase of analysis involved returning to the original interview transcripts seeking verification or contradictions with the coding of the case narrative. Finally, all the case studies narratives were coded independently by a second and in some cases a third researcher. Results were tabulated and approaches similar to constant comparison (Fram, 2013) were used. Analysis was then agreed.

Ethics and data presentation

Ethical approval was gained through institutional processes. All schools applied to take part in the project and opt-in ethical consent was obtained from headteachers and teacher participants for engagement in research activities and opt-out consent obtained from parents for students' participation in the additional end-of-year test. Further consent was obtained specifically from case study schools prior to visits and during interviews with teachers and students (here, opt-in consent was sought).

Ethical considerations compel us to limit the extent of the case details divulged in the paper, specifically:

- excluding regional location from our description;
- rounding data on school size (to nearest 100) and GCSE attainment 5 A to Cs - a key accountability measure (rounded to nearest 5);
- presenting data on Free School Meals (FSM), a proxy measure of socio-economic status, as a quintile (related to national data) rather than as percentages.

In keeping with the consent obtained, data are reported here anonymously using pseudonyms. Given the focus on situatedness this is an uncomfortable compromise, but the ethical responsibility to participants overrides our wish to give full details. However, in statistical analysis, full and accurate data were used. All data were stored on password-protected systems complying with institutional and legal policies for storage.

Implementation and process evaluation findings: variations in engagement and participation

In this section, we report an overview of the implementation and process evaluation findings most pertinent to the paper.

The recruited sample

The sample recruited to the project had a lower proportion of FSM pupils than in the school population as whole. In 2013, the national average was 18.4% of pupils classed as FSM at the end of Key Stage 2 (DfE, 2014).

As noted, the FSM data for the intervention sample are non-parametric. However, the skew in the MRP sample in relation to the national distribution can be seen from Table 2 below for the 29 secondary schools.

Table 2: FSM quintile frequency for the 29 MRP secondary schools

FSM quintile	1st	2nd	3rd	4th	5th
Frequency	1	3	3	5	17

Thus, schools recruited to the project had lower proportions of FSM pupils than the national population. Lower-capital schools are potentially under-represented in the sample. This was not a criterion for recruitment so having FSM values below the national average may be indicative of schools' capacities to engage in such a project and/or a reflection of the schools' social capital, given that recruitment was achieved in part through already-existing networks.

Attendance

Table 3 provides details of the number of events attended. The total number of teachers who attended at least one event is greater than the original 60 nominated teachers, showing that some schools sent additional or replacement teachers

Table 3: Frequency of event attendance

Number of events	1	2	3	4	5	Total
Number of teachers attending	4	7	13	24	19	67
%	6	10	19	36	28	100

Source: Boylan et al. 2015, p.30

Core teachers were asked which of the 15 units of material they had used and, if a unit had been used, with how many classes. Material use data were combined with the attendance data for an 'on treatment analysis' in the RCT assessment of impact (see Boylan et al. 2015a, 2015b). Subsequently, these data were used to rank the schools in terms of participation and engagement (see below). In each survey, the percentage of teachers reporting use of materials from any of the 15 units with any class ranged from 22% to 84%, with a mean of 56%, a median of 55% and a standard deviation of 22%.

From the case study interviews, discussions at TIME events, and surveys completed during the TIME events, there emerged three patterns of material use.

- A small number of teachers used or attempted to use all the materials with at least one of their classes. The reported motivation was mixed, sometimes out of loyalty to the project, and sometimes more strategic, in order to trial all the materials available.
- Some teachers used materials with specific classes they had chosen to implement MRP throughout the project.
- Other teachers selected materials on a more ad hoc basis to use with specific classes if they considered them to be suitable.

There is some evidence that there were similar patterns of engagement to those reported by Remillard and Bryans (2004). Greater selectivity was exercised by more experienced teachers or in departments with greater confidence in their approach to teaching mathematics.

The relationship between attendance, material use and outcomes

In the RCT analysis, the relationship between attendance, material use and outcomes was examined. Drawing on both the TIME event attendance figures and the data on the use of the MRP materials, a criterion was set to distinguish between teachers who had attended and used materials and the teachers who had not done so. In terms of attendance, teachers who attended at least two of the first four TIME event days were selected. These were events that had taken place before the PiM test. In terms of the use of MRP materials, a low fidelity threshold was identified. Teachers who reported using at least some of the MRP materials (one or more units) were selected.

Combining these two teacher-engagement criteria yielded a sub-sample of 2,622 (77%) of pupils in the intervention group schools who all were taught by a teacher who attended at least half of the TIME event days and reported using some of the MRP materials. In addition, a sub-sample of 805 (23%) pupils in the intervention group schools was also identified. These 805 pupils were taught by teachers with low or no engagement with the MRP in terms of attendance and material use.

In terms of PiM attainment, on average this 'teacher engaged' intervention group sub-sample (77% of pupils) attained more highly compared with the remaining 'teacher not engaged' intervention group sub-sample (23% of pupils). The two measures were 98.6 and 95.5, representing a difference with an effect size of g=+0.2.

Attendance, material use and school characteristics

Table 4 provides a summary of attendance and material use by 29 of the 30 MRP participating schools. The schools are ranked by considering use of materials and attendance as a proxy for participation and engagement. The ranking method is discussed below. The names are pseudonyms adopting names of trees that are listed alphabetically in rank order. The eight case study schools are shown in bold typeface. The use of the alphabetical pseudonyms means that, in the discussion of case studies that follows, the relative rank of schools can be easily identified directly from the name used. The thirtieth school was a middle school and excluded from the analysis, for reasons noted above. In addition, one school - *Yew* - is listed at the end of the table and in some cells the letter 'm' appears. This stands for missing data. Teachers from *Yew*, as discussed below, attended the first CPD two-day event and subsequently did not participate in any more TIME events. However, they continued to receive materials and in a telephone interview they reported that they did use them. Teachers at *Yew* did not administer the PiM test but did not withdraw other data, and they provided information on why they did not continue to participate in CPD events. The reasons are described in the next section. Given that they did not withdraw their data, they are included in analysis and reporting.

The table includes the Ofsted grade: this is an accountability measure where 1 represents a school judged ‘outstanding’, 2 is 'good', 3 is 'requires improvement', 4 is ‘inadequate’ and leads to intensive ongoing scrutiny under 'special measures' (Ofsted, 2016). In keeping with the ethical considerations discussed above, the percentage of pupils who receive free school meals (FSM) is categorised as a quintile with '1st' indicating that the school is in the highest 20% of schools nationally for FSM and ‘5th’ the lowest. FSM is a means-tested benefit and is used as a proxy for socio-economic disadvantage. It should be noted that there is a known under-count of FSM claimants (Iniesta-Martinez and Evans, 2012).

GCSE is the examination taken at the end of compulsory schooling and a principal accountability measure. GCSE results are correlated with the socio-economic status of pupils in school. Taken together, the Ofsted rating, FSM and examination results represent and are markers of different types of school capital, as discussed above. The number of pupils on the roll of each school is rounded to the nearest 100 again to help preserve anonymity. Although the data presented are in

rounded and categorical forms, full and accurate data were used to generate the descriptive statistics.

Table 4: School characteristics and engagement

	Retrieved data				Implementation and process evaluation data					
School	Ofsted grade	Quintile FSM	Number of pupils to nearest hundred	Percentage GCSE (5 A-C) rounded to nearest 5	Number of times units used with any class	Material use ranked	Number of events attended	Attendance rank	Sum of attendance rank and material ranks	Overall rank
Alder	3	5th	1,300	80	133	1	10	1	2	1
Apple	2	5th	900	70	71	2	10	1	3	2
Ash	3	2nd	1,200	50	57	3	10	1	4	3
Aspen	2	4th	900	70	48	4	10	1	5	4
Beech	**2**	**5th**	**1,400**	**80**	**45**	**5**	**10**	**1**	**6**	**5**
Birch	2	4th	800	75	33	7	10	1	8	6
Black Thorn	2	5th	600	80	30	8	10	1	9	7
Cherry	2	5th	1,000	80	83	6	9	10	16	8
Chestnut	**2**	**5th**	**1,000**	**75**	**45**	**9**	**9**	**10**	**19**	**9**
Elder	**2**	**5th**	**1,300**	**65**	**63**	**9**	**9**	**10**	**19**	**9**
Elm	3	3rd	600	50	58	10	9	10	20	11
Fir	3	5th	1,200	65	14	21	10	1	22	12
Hawthorn	**1**	**5th**	**1,400**	**80**	**10**	**24**	**10**	**1**	**25**	**13**
Hazel	2	5th	1,500	65	72	11	8	16	27	14
Holly	2	5th	900	80	43	11	8	16	27	14
Hornbeam	1	4th	1,500	80	26	12	8	16	28	16
Larch	4	4th	1,000	40	14	21	9	10	31	17
Maple	**1**	**5th**	**1,700**	**70**	**28**	**22**	**9**	**10**	**32**	**18**
Oak	3	1st	700	55	16	17	8	16	33	19
Pear	2	5th	1,500	80	16	17	7	21	38	21
Poplar	4	5th	1,000	60	19	18	7	21	39	22
Rowan	2	2nd	800	65	16	19	7	21	40	23
Scots Pine	**2**	**5th**	**1,500**	**70**	**9**	**19**	**7**	**21**	**40**	**23**
Spruce	2	3rd	1,300	65	16	17	6	25	42	25
Sycamore	**3**	**4th**	**400**	**60**	**8**	**26**	**8**	**16**	**42**	**25**
Walnut	**2**	**5th**	**800**	**70**	**15**	**21**	**4**	**28**	**49**	**26**
Whitebeam	2	5th	1,000	75	8	26	5	27	53	27
Willow	3	3rd	900	55	4	28	6	25	53	27
Yew	**4**	**2nd**	**650**	**46**	**M**	**M**	**4**	**28**	**M**	**28**

To calculate an overall rank of engagement the following procedure was used. For material use, the number of times any of the materials were used with any class was calculated. These values were then ranked. For attendance, the number of events attended was used. Schools were ranked on this value. A sum of the material use and attendance rank was then calculated and used to generate an overall rank.

There are alternative ways of generating a rank of each component and so of the overall rank. For example, the material use rank depends in part on how many classes the teachers in a school taught in Key Stage 3. The more classes taught, the greater the opportunity there was to use the materials. Other ways to rank the schools can take that into account. Another alternative is to take the highest value for use of materials and express other values as a percentage of this highest value. Similarly for attendance, a percentage attendance at events can be used. The sum of percentages of the two components can then generate an overall rank.

Using the latter approach, the following rank order of the case study schools was obtained:

Elder, Beech, Chestnut, Maple, Hawthorn, Sycamore, Scots Pine, Walnut, Yew.

Thus, there is some change in the order. When correlations were calculated between ranks determined in different ways, high coefficients were found. This indicated, perhaps unsurprisingly, that the different ways of ranking do in fact generally describe participation and engagement in similar ways. Thus, the simplest approach has been followed, as shown in Table 3.

Special measures

As noted above, one school - *Yew* - withdrew from participation in the professional development component, did not administer the final pupil assessment, but did not withdraw their data from the implementation and process evaluation. These circumstances arose from an 'inadequate' OFTSED judgement and being placed in special measures. This dramatically curtailed engagement. Even though we are able to report only limited data, it is important that this case is not excluded, given the central focus on participation and engagement. The decision to withdraw was made by the senior leadership team; the teachers involved were disappointed at this decision, reporting that they were continuing to use the first set of materials provided.

Two other schools, neither of which was a case study school, began the project with an Ofsted grade 4. One of these, *Larch*, had 40% A-C GCSEs but lower than average FSM scores and was ranked 17th for participation and engagement (the other, *Poplar*, appears to have a more mixed position in terms of school capital). For *Larch,* it appeared from the data collected and the TIME meetings that

engagement in such external projects was seen as a route out of their predicament and designation. Thus, senior leaders at *Larch* and *Yew* had responded differently to the special measures designation.

In the sections that follow, these differences in levels of participation and engagement are explored through the theoretical frameworks previously discussed, that is in relation to school capital, figured worlds, and systemic coupling.

Case studies

In this section, analysis from the case study data is reported. Two of the schools - *Hawthorn* and *Maple* - had 'high capital' while the rest held 'middle capital'.

In relation to system coupling, five different positions are found in the cases that follow:

- loosely coupled to the performativity system; with more close coupling to the department and/or school (*Maple and Hawthorn* - high capital; *Beech* and *Sycamore* - middle capital);
- loosely coupled to the performativity system; loosely coupled to the department and/or school (*Elder*);
- loosely coupled to the performativity system when engaging in MRP lessons but not generally; loosely coupled to the department and/or school when engaging in MRP lessons (*Chestnut*);
- more closely coupled to the performativity system; more closely coupled to the department (*Scots Pine*);
- more closely coupled to the performativity system; more loosely coupled to the department (*Walnut*).

Hawthorn and *Maple*: entrepreneurial engagement

Two systemically advantaged 'high capital' schools, *Hawthorn* and *Maple* appear to have a middle level of engagement overall (ranked 13th and 18th respectively). This relationship of high capital and middle engagement exemplifies that there is not a direct and clearcut association between level of capital (or proxies) and engagement. These two schools are discussed together as they had similar characteristics including levels of engagement. Both were larger than average suburban schools with a sixth form. They had outcomes above the national average, were judged outstanding by Ofsted and were converter academies leading small multi-academy trusts (see Courtney, 2015; Wilkins, 2017 for a discussion of English school governance arrangements at this time). Both of the schools had a significant profile in their respective regions in terms of leading initiatives including professional development. They also both had designation as Teaching Schools (Husbands, 2015).

Hawthorn, for example, was in a powerful position, with their Teaching School status conferring symbolic capital (Coldron, et al. 2014). *Hawthorn* hosted the regional MRP network/professional development meetings: this was a marker and consequence of the school's social capital derived from its existing relationships with the NCETM. *Maple* also can be characterised as privileged, being one of an elite group of schools designated as Teaching Schools with responsibility for leading professional learning and having a key role in an increasingly school-led system. The privilege is evident in resourcing: the mathematics department was described as over-staffed and well-funded and so releasing teachers to attend professional development was not a challenge.

With regard to the figured world, in both schools professional development was valued and supported by senior leadership and this was reflected in the departmental culture. This enabled teachers to go to MRP meetings, meet with colleagues and do the lesson study activities. In *Hawthorn*, the school had prior involvement with initiatives led by the local higher education institution partner, including lesson study projects. In *Maple,* the mathematics department was attracted to the MRP as it built on their engagement in a previous research project focused on multiplicative reasoning and was aligned with their quest for evidence to inform practice: “So for us it’s perfect, because it fits with our whole school look at evidence based pedagogy” (Maple headteacher). Similar to *Hawthorn*, this school also had links to local higher education institutions and staff were encouraged to engage in masters degree study. Both schools had prior involvement with NCETM initiatives.

At *Maple*, the Key Stage 3 mathematics coordinator (Maple core teacher 1) initiated engagement in the project, working with a teacher who was in their second year of teaching. *Hawthorn* was approached by the NCETM to host the regional network meeting of the project - signifying the social and cultural capital of the school (and reflected in its dedicated training suite). In both schools, teachers had, in general, considerable agency over teaching approaches and how the curriculum was taught. In *Maple,* for example, the mathematics department scheme of work provides teachers with a structure, but decisions regarding approaches to teaching are the province of individual teachers, supported by a culture of collaborative curriculum development in the department.

The head of department at *Maple* stated that they had an approach to teaching that resonated with the MRP approach:

> *As a department we look for conceptual understanding through group work, through student talk and through developing ideas, rather than front of classroom delivery*. (Maple head of department)

The department staff were supported by the headteacher to experiment:

> *His main concern is for students to become better and understand maths better, and he doesn't jump through hoops, so that's great to have a manager like that really.* (Maple head of department)

Thus, the figured world of mathematics teaching at both schools and the approach to professional development was aligned with the MRP, allowing coupling to the learning activity system. In addition, at *Maple* (as indicated by the last quote) and *Hawthorn*, the outstanding Ofsted grades, the Teaching School designation, oversubscription and higher than average examination results meant that the performativity system was not a consideration. In both schools, core teachers involved in the project were given the time and support to get to know the MRP materials during the year and reported sharing their learning with the department or involving others in activities, for example through lesson study. Involvement in the project was reported to have led not only to learning for the teachers directly involved but also the whole department, with attendant benefits going beyond the focus on multiplicative reasoning to support a general enhancement of dialogue about children's mathematical learning. Thus, collaborative relationships meant that the external MRP system was coupled to the departmental systems.

However, when departmental involvement in MRP was probed in interviews, the scope of involvement was found to be more limited in *Maple*. Departmental participation consisted of one department meeting where materials were shared and there was some apparently superficial understanding and adoption of pedagogical approaches.

The departmental involvement aside, the teachers participating in MRP in both of these schools made less use of materials than teachers in other schools. *Hawthorn* was ranked 24th for material use and *Maple* was 22nd. Their overall middle rank for participation and engagement is due to relatively high levels of attendance. Thus, the confidence of the schools to "not jump through hoops" appears to have extended to the project in that the teachers and schools were more selective than many schools about which materials to use and how they chose to engage.

Both schools were externally focused and entrepreneurial; the MRP was one of a series of projects they were engaged in and they both expressed the intention to run their own local project based on MRP and, in the case of *Hawthorn*, a similar project on algebra. From discussions with teachers and senior leaders, it appeared that the value of MRP for the schools was as much in its potential marketability to other schools as a benefit to the school itself.

In both schools there was confidence to adapt material, expressed when talking about plans for the future. The head of department at *Hawthorn* said "we will still keep the adapt thing. We would refine it ourselves and say this is how we've refined it". The intended professional development for

other schools, based on the MRP materials, focused similarly on how to adapt them in other school contexts. This feature of adaptation is reminiscent at a school level of the way that experienced teachers have been observed to respond to curriculum design projects, where the more experienced teachers are less likely to follow a curriculum project design fully (Remillard and Bryans, 2004).

Beech: pressure and the project 'kick-starts ambition'

Beech is a large 11-18 academy school in a small town, judged good by Ofsted and with a higher than average proportion of pupils gaining 5+ A-C grades at GCSE. It had the highest level of material use reported of the case study schools and full attendance at events. Whilst not enjoying the same high level of capital as *Hawthorn* and *Maple*, *Beech* was still relatively advantaged compared to many schools.

Involvement in the MRP was initiated by one of the core teachers and supported by the head of department who viewed it as an opportunity to develop mathematics teaching in the department. Although the school as a whole was relatively secure in terms of results and Ofsted grading, the mathematics department was under some internal pressure as noted by the head of department.

> *Anything that might improve our mathematics teaching is worthwhile doing […] I think we are increasingly pressured because of how success is measured in schools, rightly or wrongly. We're all judged on league tables. As a school, if maths or English fail, we've all failed, so we do get that additional pressure. […] I think the best thing about [MRP] is it's genuinely kick-started our ambition to share good practice and do it, not just talk about it.* (Beech head of department)

We inferred that the reference to league tables indicates a concern for performance and accountability measures generally. At *Beech* there was a sense of engagement with the project's underlying principles as novel. Whether or not this was a cause of change, there was agreement across interviewees that participation had changed the core teachers' practice.

> *It has changed the way that I teach, and the way that I think about planning […] this has fundamentally changed the way that I approach lessons. [The focus is] what do I want them to understand?* (Beech core teacher 1)

In part, this transformation was attributed to close collaboration with a colleague, the two teachers working through three cycles of lesson study together. They "*couldn't believe what [they] noticed in each other's lessons*" (Beech core teacher 2).

Although the lesson plans provided as part of the project materials were appreciated, the key change in practice was deeper, involving the teachers observing closely where the students were in

their learning and working out what they needed next. Rather than adhering to lesson plans, they worked flexibly with them, empowered by the project to "*take the time […] and just see how it goes*" (Beech core teacher 1):

> *It's not about the lesson plans, but they're lovely, they're a lovely way in and it gets everybody thinking about it, it's about not racing through a lesson.*

This was echoed by the other core teacher at *Beech*:

> *It's not about us anymore. It's about where the kids are at and following their needs*. (Beech core teacher 2)

The core teachers' enthusiasm and close collaboration appears significant in the sharing of approaches with the department.

Departmental engagement in the project supported the core teachers both to explore the materials and approaches and to engage the department. The collegial departmental ethos, and so the 'more closely coupled' relationships between the core teachers and the department, buffered the impact of performativity discourses. Important too was the attitude of the head of department who, whilst concerned with 'league tables' and under internal pressure, did in fact support teachers to engage in professional experimentation (Clarke and Hollingsworth, 2002). The pressure of accountability measures was construed not as a barrier to involvement but as an argument for engaging in the project. At *Beech*, the figured world created by the teachers allowed them to focus attention on teaching for understanding, buffered from a performativity system that frequently forces teachers to focus on high stakes tests.

There was evidence that participation in the MRP project had changed the way the whole department worked. The two core teachers readily took responsibility to lead the initiative, fostering a collegial ethos. Core teacher agency increased through participation in MRP; the teachers perceived the project as giving them permission to put aside performative discourses (focused on test outcomes), replacing them with a practice led by a focus on children's understanding.

Thus, at *Beech* an outcome of the engagement appeared to be, for a time at least, a loosening of coupling to the performativity system and a change in the figured world of the department both in relation to mathematics pedagogy but also regarding how the department worked together through relatively tight coupling to the MRP system and figured world.

Sycamore: fits with our way of teaching and collaborating

Similar to *Beech*, in *Sycamore* there was engagement by the department as well as the core teachers. *Sycamore* was a small, community 11-16 school on the outskirts of a town in a rural

county. It is an improving school as judged by Ofsted, having secured a grade of 'good' shortly before engaging with the project and with attainment rising over the previous three years. The small department had an established culture of meeting every three or four weeks for “learning meetings” for “sharing ideas” (Sycamore core teacher 2).

Approaches promoted within the school were:

> *child-centred learning, having learning leaders within the group, children talking maths, challenging questions, putting things into context, problem-solving.* (Sycamore core teacher 1 / head of department)

Although *Sycamore* was ranked 25th for participation and engagement, this understates the department's relationship to the MRP project. This is an issue returned to in the discussion of methodological implications. Overall attendance was eight out of 10 possible teacher events. However, there were issues of long-term illness and in a small school it was difficult to send a substitute. Furthermore, the period of illness meant that MRP materials were not used, for example, by substitute teachers. However, the school intended to use the materials after the formal end of the project. In addition, the size of the school (indicated by number of pupils on the roll) distorts the relative level of material use. The relative level of material use is seen to increase, compared to other schools, if we utilise an alternative measure of the ratio of material use per pupil in the school.

Notably, the head of department was directly involved in the project as core teacher and the senior leaders supported involvement, noting its alignment with their focus on supporting staff to engage in research-informed practice. The enthusiasm for the project was evident in the interviews. The whole department was involved, with active involvement of a third teacher:

> *We’ve all got quite excited about it – it’s been really good.* (Sycamore core teacher 2)

In *Sycamore*, the figured world of the mathematics department, in terms of their shared approach to teaching mathematics, aligned with the MRP pedagogical approach. However, one teacher described the actual models and representations used in the MRP as "a revelation" and interviewees engaged in sophisticated discussion about the various pedagogical approaches and MRP materials.

The department orientation to school-based professional development also aligned with the MRP approach:

> *We all have a very similar philosophy within the department, so we’re very used to feeding ideas to each other and sharing ideas.* (Sycamore core teacher 2)

In the small department of three teachers and two dedicated teaching assistants, the MRP was seen as a shared collaborative departmental endeavour.

There was no evidence from the interviews that issues of external performativity were of any great concern or influenced engagement to any extent and they were not mentioned as barriers. The school had a relative lack of competition in the local area. Returning to the issue of symbolic capital, consideration of the figured world and coupling to the performativity system gives some insight into how the school's 'good' category provided a level of security at a local level greater than in other schools similarly designated.

Elder: "others are nervous to try it"

Elder is a large suburban school judged 'good' by Ofsted. *Elder* had a high level of participation and engagement in the MRP. Involvement in the MRP project was instigated by a non-specialist teacher of mathematics (Elder core teacher 2) who paired with an experienced mathematics specialist for the duration of the project. A non-specialist is a teacher trained to teach another subject but who is teaching mathematics, a relatively common occurrence in England due to current teacher shortages (Moor et al. 2006). This non-specialist teacher had participated in a higher education institution-led intensive CPD course in mathematics education for teachers with similar backgrounds. The philosophy of mathematics education underpinning this intensive course appeared to align with that of the MRP.

Participation was initially supported by the head of department who convinced senior leaders to release teachers to attend the TIME meetings. However, beyond that contribution his involvement was minimal and he expected the two core teachers to "*just run it and lead it*" (Elder head of department).

There was little apparent alignment with existing practice or vision for the department. The core teachers shared materials at two departmental meetings but found it difficult to engage other teachers. The head of department had not used the materials and the approaches appeared to differ so markedly from those used by the majority of teachers in the department that they too had been reluctant to engage. One core teacher explained this in the following way:

> *I think because there are a lot of staff here who are nervous about losing control of the class and letting [the students] make the mistakes. […] some people just have their way of teaching and this isn't how they would normally teach a lesson and they were nervous to try it.* (Elder core teacher 1)

The core teachers, however, found the pedagogical approaches novel and were enthusiastic about the materials; they were encouraged to give students time to explore, to make mistakes, and to be independent:

> *I think I learnt to let a lot more mistakes be made, but maybe thought more about how to point them out, or not to point them out but to get them to see that they'd made a mistake.* (Elder core teacher 2)

Coupling was loose, both to the department (which limited the impact on the wider department) and to the performativity system. The figured world of the MRP aligned with the values and purposes of the two core teachers but not with those of the department. The two core teachers created a figured world in their own classrooms based on the pedagogical principles that underpinned the MRP. Concerns with assessment outcomes were not evident in the interviews with the core teachers or with the head of department. The issue of 'loss of control' was cited as a more important concern than the possible implications of examination results, illustrating how performativity cultures may be expressed in a variety of ways in figured worlds.

Chestnut: taking risks

Chestnut is a larger than average size secondary with a predominately White British intake. It is significantly below the national average in terms of pupil premium eligibility but has higher than average proportions of pupils with special educational needs. The school was most recently judged 'good' by Ofsted. However, this 2013 judgement represented a fall from an 'outstanding' grade in previous inspections.

Core teacher 1 became aware of the project and subsequently involved in it through a pre-existing professional relationship with one of the professional development leads running the professional development programme in the region - underlining again the importance of social networks. Three teachers became participants; they rotated attendance but all used the materials. This was an early indication, at least for these three teachers, of the way the MRP became an opportunity to create space to exercise some agency in an otherwise restrictive school culture.

The core teachers generally reported feeling supported by the senior leadership team and their head of department. However, despite this perception of support, there was little within the data to suggest that it amounted to much more than a licence granted to attend the professional development events and generally to "get on with it'". Senior leadership or head of department involvement in the details of the programme appeared detached from the core teachers' participation. Although this lack of involvement appeared to be enabling to an extent because it provided space for teacher agency, it might also at least partially explain why the core teachers still harboured significant concerns about how senior staff would interpret and ultimately judge any teaching linked to the MRP project. The core teachers were mindful that being genuinely engaged within the project necessitated leaving behind the *"normal curriculum map"* and *"teaching*

something completely different" where the predominant outputs were verbal as opposed to written. This was an unsettling prospect in the context of an accountability system where they needed to be:

> *demonstrating progress at any moment in the room. Although we know that pupils can be making progress by sitting quietly thinking about something, we've got to then demonstrate it…* (Chestnut core teacher 2)

Despite being convinced of the pedagogical underpinnings of the MRP and outlining the benefits to their own teaching, core teacher 2 took a pragmatic position ensuring that such teaching was never seen as part of formal performance management.

> *Certainly we wouldn't have let anyone come near this during lesson observation.* (Chestnut core teacher 2)

Given these concerns it is perhaps unsurprising that the core teachers valued the collaborative nature of work on the MRP as they felt it *"shared the risk"* (Chestnut core teacher 3) and so mitigated exposure to negative judgements from senior colleagues more peripherally involved.

We posit that the three core teachers moved between two figured worlds. One world, possibly ephemeral and temporary, arose when teachers were collaborating and using the MRP materials. The other, the figured world of normal mathematics teaching, was subject to performance management and scrutiny. The collaboration between the teachers allowed them to create a space to act outside the everyday performativity pressures in the school. Material use by teachers at *Chestnut* was relatively high, and so was attendance thanks to a pattern of rotating attendance among the three core teachers.

Scots Pine: a limiting 'strict' structure and compliance

Scots Pine, part of a relatively large multi-academy trust chain (MAT), is a large 11-18 school located in an urban area. Academy chains vary in orientation and culture (Wilkins, 2017); in this case the MAT was internally orientated with relatively rigid structures and conformity across the chain. The school is average in terms of commonly used indicators of socio-economic status and it was judged 'good' by Ofsted. The positioning of the school is more difficult to describe than others. The academy chain as a whole had a relatively privileged position, containing at least one Teaching School that led the MAT. However, there is some evidence that the status of *Scots Pine* itself was somewhat precarious, particularly with regard to staffing the mathematics department. During the lifespan of the project there were several staff changes, a number of newly qualified teachers joining and the long-term absence of one of the core teachers.

The head of department characterised the department's approach to mathematics as collaborative, describing the team as "*open to new ideas*" with "*lots of teaching in team and in pairs*". However, interviews with teachers centrally involved in the project revealed a different picture, evidencing constraints on the department imposed by the central bodies of the chain. The MAT itself was a relatively tightly coupled system with prescribed ways of working of the type that has been characterised as a 'command and control' hierarchy in which relatively little power is delegated to individual schools (Wilkins, 2017).

Although the participating teacher and the head of department were positive about the MRP professional development and enthusiastic about the materials in principle, the level of material use recorded was one of the lowest of any of the schools.

In keeping with the culture of central direction, participation in the project was initiated by a senior leader with a MAT responsibility rather than by someone based at *Scots Pine*. Two relatively inexperienced teachers were involved. Core teacher 1 was encouraged to participate in order to strengthen promotion chances. The head of department reported the school's support for the department's involvement in the MRP, for example in facilitating cover and in acknowledging that there would be a difference in what teachers might be observed doing in class. Participation in the MRP was limited by the staffing difficulties noted above, but also importantly by the perceived constraints of the existing school structures:

> *I think we're very limited in the fact of we do have quite a strict structure to follow […] and an hour's lesson doesn't allow you to do the larger tasks and the ones that are going to be more time consuming. I don't know whether it's that we're not allowed to do it, or whether you're just conscious of it.* (Scots Pine core teacher 1)

The constraints of staffing and structures were also likely to impact on future developments related to the project: core teacher 1's new role took her away from teaching mathematics and both core teacher 1 and the head of department were concerned about how they might make use of the resources from the project given the academy's existing lesson structure.

> *We will look through them, because we're currently writing a new scheme of work for the new specification, so we'll see what we can use and what we can't. It will be limited because of the time. We don't like things to take more than one lesson*. (Scots Pine head of department)

Pressures to conform meant that the core teachers felt obliged to use the existing school lesson structure:

> *We didn't want people coming into our lessons and going, 'You haven't got your outcomes,' so that's why we put it into that structure.* (Scots Pine core teacher 1)

A lack of departmental time was cited as another reason for limited involvement in the project. School structures restricted participation in other ways: "*For the students our main barrier was that we test and reset regularly*" (Scots Pine head of department). These tests resulted in movement of pupils between classes, so breaking the continuity of having a teacher familiar with the project materials. Staff absences exacerbated difficulties:

> *So some of them [students] haven't even had a teacher, never mind one that's been delivering the right stuff for them.* (Scots Pine head of department)

The core teacher at *Scots Pine* was closely coupled to the school system which was of greater importance than the department. Viewed another way, the departmental system was closely coupled to the school system and required to confirm to MAT-wide strictures. The school system, in turn, was closely coupled to the wider performativity system. This restricted engagement in the project. Accountability discourses were transmitted through a tightly coupled internal structure. In this structure, an internal orientation to change - within a school improvement discourse - arguably came at the expense of a complementary orientation to potentially beneficial external stimuli. Relationships were marked by compliance. The figured world of the school appears more uniform and is characterised by what Clapham (2015) has described as post-fabrication: the types of practices which are commonly fabricated during inspection become the ongoing school norm.

Walnut - working in isolation

Walnut is a recently converted 11-16 academy school in a rural county. It is described by Ofsted in a recent report as a 'good' school with improving results although attainment in mathematics was below average. The participation and engagement of *Walnut's* teachers was the lowest recorded in the case studies.

The recently appointed head of department treated the Ofsted finding that the school's mathematics results were lower than other subjects as a motivator and argument for change. His preferred teaching approach of increasing discussion and collaborative learning was aligned with the MRP approach. However, he recognised there was resistance among established staff. The initial impetus to get involved came from core teacher 1. Both the head of department and the lead core teacher were new to the school and the second teacher was a non-specialist maths teacher. Thus, the relationship of key participants in the project to other departmental members was new or

tenuous. There was no mechanism in place for systematic sharing of practice and this limited the influence of the MRP on the rest of the department.

In *Walnut*, the head of department reported trying out some ideas and noted *"other staff have picked up different bits and pieces"* (Walnut head of department). The limited involvement by the rest of the department was acknowledged:

> *I think we've worked in isolation this year really. We've had to get on and do it. […] The department are aware of [the MRP] […] and I've shown everyone where the stuff is, but getting the resources, printing them off, reading through it, doing it are different things. […] I think if you've been teaching a long time, you go along doing it the way you've done it before.* (Walnut core teacher 1)

Significant staff turnover, including the forthcoming departure of core teacher 1 and the redeployment of the non-specialist teacher out of mathematics at the end of the academic year, pointed to the likelihood that the project would have limited long-term impact.

A further potential barrier to engagement was the way that teachers were judged, based on drop-in lesson observations, and the high stakes of these judgements. Core teacher 1 explained that the MRP design did not match the expectations held by observers as to what constitutes good teaching:

> *The school favours a particular type of format for lessons, and if you don't do it in that way, there's a risk that maybe you won't come out with the grade that you want […] I was prepared for people to come in and say that they weren't happy with it, but I was confident that I could justify what we were doing, because I think it was really, really good. I don't know if they would see that as a proper lesson*. (Walnut core teacher 1)

The above quote points to the issue that there was a more uniform figured world in the school, with less scope for departmental difference or autonomy. Here, what was important was the coupling to the school rather than the department, while the figured world of the school was closely coupled to performativity systems.

Patterns in capital, figured world, systemic coupling and performativity

In this section, we offer a set of reflections on patterns and relationships observed in relation to capital, figured world and systemic coupling for the eight case studies.

Capital does not predict participation and engagement

In Table 4, three variables were included which are aspects of school capital in themselves and also proxies to an extent for other dimensions of organisational capital and influences on schools' capital

more generally. These variables are Ofsted grade, GCSE outcomes and pupils with FSM. Analysis was undertaken of correlations between these variables and different components of participation and engagement, including raw data and school ranks, as well as the overall ranking. Application of the Shapiro-Wilk test for normalcy established that the school capital variables were not normally distributed. Accordingly, Spearman's non-parametric correlations were calculated to examine associations between variables.

Whilst FSM and GCSE 5 A-C were inversely correlated, as would be expected (EEF, 2018), other variables were not correlated. Where alternative measures of attendance or engagement were tested, similarly no correlations were found. Thus, the study indicates that simple or linear patterns of engagement cannot be discerned between the three school-level variables. Nevertheless, school characteristics appear to influence in more complex ways how schools engaged in the MRP, as the case studies indicate. For example, at *Hawthorn* and *Maple*, as previously noted, an overall middle rank for level of engagement obscures high attendance (afforded in part by their high capital status) and low material use - possibly indicating that MRP materials were deemed appropriate for the schools' clients but less important in the schools themselves.

Capital as relative, local and historical

In discussing *Sycamore*, we noted that the relative lack of competition from other schools locally allowed the school a degree of security to engage in greater professional experimentation than others. Thus, school capital is not absolute. It shows variability in its influence on the logic of action by schools, departments and teachers. Given that different capitals can be converted and exchanged (Bourdieu, 1986), this variability is perhaps to be expected. Nevertheless, it indicates that capital cannot be read in any simple way from school variables. Moreover, capital - or at least status and how this influences schools' figured worlds - is historical. *Chestnut* has previously been rated 'outstanding' but the drop to 'good' appeared to be a powerful influence on senior leader practices.

Figured worlds as dynamic

In the accounts of the theoretical frameworks used in this paper, the concept of figured world was contrasted with habitus. The value of figured world as the more fluid construct to understand performativity and engagement is evidenced in a number of these case studies. For example, it grants an understanding of how, at *Chestnut*, teachers created a figured world of MRP that allowed them to "share the risks". Indeed, this risk-taking appears to be central to the teachers' purposes. This figured world ran counter to that of senior leaders in the school, and so had to be concealed from them to an extent. Outside of MRP engagement a different figured world pertained. This

echoes the experience of novice teachers moving between figured worlds of traditional and 'reform' mathematics in the United States (Horn et al. 2008).

At *Beech*, the figured world of the department was dynamic not static and it changed through involvement in the project. As an aside, it is rather sobering that this case was the only example of the project influencing the department in such ways.

Relative influence of different systems

Three different systems that influenced core teachers' engagement and implementation of the MRP 'system' were the department, the school and the wider performativity system, and the relationships between these as conceptualised through the notion of coupling. The extent to which the department or school was important varied. At *Walnut* and *Scots Pine,* the most influential system appeared to be the school rather than department, and beyond the school, in these two cases, the performativity system carried weight. At *Sycamore*, the department - and possibly the school - acted as a buffer to the performativity system. At *Elder*, the relatively looser coupling to the department meant that the MRP learning activity system was more influential.

Notably at both *Elder* and at *Chestnut*, teachers experimented independently, although in *Elder* the relationship appeared to be one of 'benign neglect' by leaders and in *Chestnut*, the teachers felt compelled to be discreet about what they were doing, if not actively conceal it. At each of these schools, as well as the MRP there was another external connection - at *Elder* to a higher education institution's CPD course and at *Chestnut* a prior relationship with a CPD lead.

Varying influence of the performativity system

The analysis in this paper started from a concern that performativity systems may undermine engagement in professional learning activities. However, it is noteworthy that this effect is not simple or straightforward. At *Beech* and also *Larch*, performativity pressures were a motivator to engage in the project. *Larch* was a school in special measures as a result of being judged inadequate by Ofsted, but was not the subject of a full case study. These observations fit with current policy discourse in England about how inspection and performance measures lead to school improvement. However, it is also clear that in other case study schools performativity pressures inhibited engagement - most notably at *Yew* (discussed in an earlier section) where teachers were told to stop attending. It was also the case at *Scots Pine*, *Walnut* and *Chestnut*, at least in terms of impeding any department-wide effects. At *Elder*, the influence of performativity did not find expression in terms of examination results but instead in "loss of control": this relates to the pervasive influences of Ofsted

on what constitutes good teaching (Clapham, 2015). Interrogating and understanding different figured worlds helps to explain why this was the case.

Capital, figured world and coupling to the performativity system and department/school

Figure 1 below draws together the preceding analysis in relation to capital, figured world and coupling. The base matrix represents the four positions schools had in relation to systemic coupling. The designation 'department/school' signals that the most influential school-level system varies. The level of capital is signified by capitalisation of the names of the two high capital schools. Bold font indicates schools where the core teachers' figured worlds were aligned with the MRP mathematics education and/or CPD purposes by the project end. *Chestnut* appears twice to represent the two figured worlds that appeared with different systemic coupling. The summary matrix uses visual emphases to convey that coupling to the performativity system is, in general, antithetical to coupling with the MRP system. If this is the case then coupling to the performativity system mitigates against the MRP system influencing teachers' practices or participating teachers influencing their departments' practices. The layout shows that schools with greater engagement with the project (first letter of pseudonym closer to the start of the alphabet) are more loosely coupled to the performativity system.

Figure 1: Coupling, figured worlds and capital

		Coupling of MRP teachers to the department/school	
		More loosely	More closely
Coupling of MRP teachers to the performativity system	More loosely	**Chestnut** (when engaged in MRP activity) **Elder**	**MAPLE** **HAWTHORN** **Sycamore** **Beech**
	More closely	Walnut	Scots Pine Chestnut (at other times)

Interpretation and implications

Having considered the MRP case studies, we now turn to the three questions that we posed at the start of the study:

1. How do performativity and accountability regimes influence participation and engagement?
2. How do situation/situatedness, systemic influences and actors' purposes help account for variation in engagement and participation in professional development innovations?
3. What are the affordances of combining mixed methods, implementation and process evaluation methods and social theory to interrogate the interplay of situatedness and systems, and purpose and engagement and participation, particularly in relation to influences of performativity?

In relation to these questions and related findings we discuss the implications of the analysis. The section is structured in three parts: policy implications, theoretical implications and methodological implications.

Policy implications: Performativity, purposes and professional learning

Two ways education policymakers seek to improve the quality of teaching are through the use of accountability measures and professional development and innovation programmes. We have shown, in this paper, how these two approaches can have contradictory effects. In England, as elsewhere, teachers' engagement in professional development is influenced by accountability systems and related performativity regimes and marketisation. These two influences also lead to differences in the capacity of schools to engage in and lead innovations and professional development. Further, they contribute to complexity in the landscape of professional development including by increasing the number of actors involved in funding, promoting or offering professional development within a quasi-market for professional development. This complexity is augmented by increased centralisation of priorities through indirect and mediated policy influences and paradoxically greater localisation of initiatives and direction of professional learning in England. All this takes place as part of what is referred to as a school-led system (Greany and Higham, 2018; Hargreaves, 2011; Husbands, 2015).

As we have shown, this environment impacts on schools' and teachers' capacity to engage in professional learning in complex ways. The figured world of schools, and in this case departments, taking part in professional development initiatives or other innovations has implications regarding the extent that schools (and the individuals within them) are able to fully commit to the professional development programme. Important here is the extent of alignment between the school and department's figured world - and so their purposes - and the purposes of the innovation or professional development. The example of *Beech* shows that this degree of alignment is not fixed. We are not suggesting that innovations should only recruit schools that have purposes or figured worlds that align with the programme's purposes. This would undermine the very idea of change projects. Nevertheless, perhaps a more circumspect attitude should be taken at the time of recruitment about schools' capacities to engage.

However, the issue of alignment and purpose is not suitably acknowledged within government policy or in design or promotion of innovations or professional learning by others. One specific way to address this is to seek and involve the commitment of school leaders to allow participating teachers to engage in professional experimentation. Another way is to build into professional development programmes support for participants to act as 'adaptive system leaders' - in other words, teacher leaders who consciously change the situation in which they are working and so understand the dynamics of change (Boylan, 2018).

A second important implication is that the study indicates that certain types of school are more able to engage in and take up opportunities. In our analysis we have used the concepts of economic, cultural, social and symbolic capital to analyse this phenomenon. As reported above, the profiles of schools participating in the MRP, in terms of percentage of pupils in receipt of FSM, exemplify that government policy in relation to performativity and quasi-marketisation may undermine its other policy priorities for social mobility, 'closing the gap' and programmes such as the pupil premium. Moreover, *Maple* and *Hawthorn* and similar schools may come to dominate the professional development opportunities made available, or at least flourish from them the most - indeed they may already be doing so. At the same time, other schools which are arguably in greater need are not able to fully access such opportunities due to other inhibiting factors. Where schools do engage, our analysis traces how performativity pressures influence levels of participation and engagement in ways that may not be easily read from descriptive statistics of association between school variables and fidelity measures.

Policymakers and funders of innovations and professional development can potentially ameliorate these effects by recognising the need to offer additional resource and incentives to schools in most need. To some extent this is being addressed in England through the Teaching and Leadership Innovation Fund (TLIF) and Opportunity Areas initiatives (Greening, 2017).

School leaders who are committed to teachers' experimentation and professional learning can consider the examples of schools such as *Beech* and *Sycamore* in which teachers are supported to engage in the MRP. This was in spite of accountability pressures. This suggests the need to decouple teachers and leaders from performativity systems, at least in relation to innovations. At schools such as *Hawthorn* and *Maple*, which are high capital and entrepreneurial, leaders might consider the extent to which they are 'walking their talk' in terms of enacting innovation in their own schools. In all schools, it is clear that if teachers who engage in external professional development are not coupled to the department then the potential benefits will be restricted to the teachers participating. Whilst this finding is unsurprising, the study shows that there can be gaps between rhetoric and even the performance of collaboration or sharing on the one hand, and a collective engagement in experimentation on the other. For policymakers, funders and school leaders, addressing ways to improve engagement and participation in professional development opportunities such as the MRP is clearly important, given the finding of an association between patterns of engagement and outcomes. It may be that the MRP did not lead to better outcomes (and the RCT did not find evidence that it did) but if conditions are optimised for engagement then improved pupil outcomes may follow. Implicitly, optimal conditions involve a looser coupling to performativity systems.

Theoretical implications: multiple perspectives

We argued earlier that there is a theoretical issue requiring attention in researching professional development in general. Arguably, there is insufficient focus on how professional development experiences and professional development programmes are situated and systemic. By situated we mean that engagement in professional development and learning are both complex social processes enacted by agents who are socio-culturally and historically embedded. The analysis presented reveals the complex ways in which schools' positions in hierarchies, school and departmental cultures, interact with professional development systems.

As we identified earlier, analytical approaches in the field of professional development evaluation, approaches such as the path models of Guskey (2002) and Desimone (2009) tend to treat context as a container for an initiative or intervention, external to it, largely static and analytically divorced from the activity. These models provide limited insights into the context beyond commonplace claims, for example that senior leader support and participant motivation are important to the success of professional development initiatives. The systems model (Opfer and Pedder, 2011) introduces or refines notions of orientation (and we link the notion of purpose to this). However, there is a need to extend this notion to consider the teachers' and schools' orientations to wider system relationships and in this case English performativity systems, as well as structural issues related to school hierarchies. Further, some account is needed of how systems influence each other and how teachers make meaning.

Our approach in the analysis was to utilise the following concepts: schools' economic, cultural, social and symbolic capital (Coldron, et al. 2014); systemic coupling (Orton and Weick, 1990); and figured worlds (Holland et al. 1998). These three constructs were applied to help understand differences in patterns of engagement in the case study schools as revealed through both quantitative and qualitative data. Thus, the application of these constructs support a re-theorising of the notion of 'context'.

By drawing on the three theorisations from wider social research, we were able to understand the situatedness of the MRP in school contexts to be fluid, active and immanent in the actions of teachers and others and in the institutional responses. This helped illuminate individual cases and – by examining the different insights the theorisations brought to each case - it allowed us to make case comparisons to build up wider principles that can be applied in future research. Thus, in this study we have shown how theoretical abstraction, as used in this paper, can enrich the field and bridge the gap identified by Opfer and Pedder (2011, p.394) "between what is unique to a specific

context and what is generalizable to other contexts". This issue of comparability is important to understanding differences in participation and engagement in professional learning.

The theoretical frames also point to the ways in which performativity systems, as one example of situatedness, may be immanent. Put another way, accountability regimes 'live' in social practices that are taken for granted.

Before turning to methodological implications, we acknowledge that other theoretical frames may provide similar insights or indeed others. We noted earlier how the notion of systemic coupling had been used alongside cultural historical activity theory (Edwards et al. 2017). It is also possible to conceive of a more systematic Bourdesian approach to analysing the case study data. We also acknowledge that having appropriated Bourdesian notions of capital as tools to support our analysis, in the limits of this paper we may not have provided in this paper a robust and full sociological justification for this extension. However, the key point here is that a social theoretical analysis is important, whether it is the social theory we have ourselves employed or alternative approaches.

Nevertheless, there are important matters that remain open in relation to these theoretical constructs. What constitutes school capital, and how different forms of capital are produced and circulated, are open empirical questions. For example, both *Hawthorn* and *Maple* were large schools and had grown due to their oversubscribed status. It is possible that size may be a marker of capital partly because it is often the case that schools with higher numbers of pupils on the roll have post-16 teaching. How far this is true remains to be established. In future studies, a more fine-grained and nuanced application of concepts of capital may be productive.

Methodological implications: the value of interpolation

There are three methodological implications that we consider. The first is the issue of fidelity measures, the second is the importance of in-depth case studies and thirdly there is the more general issue of the importance of social theory.

How to define fidelity measures might be considered an issue of detail. Nevertheless, the criteria can influence what is reported and later advised in terms of educational practice. Although we did not dwell on this issue, we have noted that different ways of measuring participation in the MRP led to different ranks and categorisations. In the original RCT, as noted, a relatively low criterion level of attendance and material use was applied. However, in general, we suggest that fidelity criteria may be misleading. The emphasis in implementation and process evaluation should be on descriptive reporting and, when IPE data are used in impact analyses, on regression modelling rather than a categorical identification of schools.

A second issue is that the full analysis presented in this paper was not possible from IPE data alone. Indeed, in the case of one school - *Sycamore* - the IPE data not only lacked depth, they were misleading. Earlier, we identified that the paper took a theoretical abstraction approach (Pawson and Tilley, 1997, p.120) to move between the empirical data (via the RCT and IPE) and theory, using our three key theorisations (capitals, figured worlds, system coupling), and back to the case study data. We used this cyclical approach with the aim of developing stronger theorisation and more insightful analysis of the empirical findings. In particular, , we recommend that researchers use the cyclical theoretical abstraction method as a new way to tackle what we might call 'the problem of context'.

The third issue of note is the importance of social theory in general to understanding patterns of participation and engagement in professional learning. As identified in work over many years in the field of theory-based evaluation, the problem of context can be framed (again drawing on Pawson and Tilley, 1997) as how to deal with context in a way that avoids attempting to iron it out via statistical modelling, which sacrifices understanding of the case altogether, and also avoids focusing in-depth on the case to the extent that each context is so particular that it allows for little meaningful comparability.

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Methodologically rigorous approaches using experimental and quasi-experimental designs for implementation and process evaluations are increasingly common in educational research. Rigorous case study work using theoretically sophisticated approaches are already well established in the education field. We recommend bringing in these approaches together and augmenting them with the theoretical abstraction method. This can support researchers to develop theoretically stronger interpretations of findings from experimental and quasi-experimental designs, as well as affording a more robust and sensitive approach to 'context

Conclusion

In England, as elsewhere, teachers' engagement in professional development is influenced by the dominance of accountability and performativity regimes, as well as the tendency towards transferring responsibility for professional development to schools and networks rather than statutory bodies. This creates a more complex professional development landscape that influences engagement in professional learning. However, we have argued that what is often referred to as 'context' in professional development literature is relatively neglected and under-theorised. The study reported here has contributed to analysing and understanding how the new landscape

influences engagement by teachers and also to theorising the influence of school and policy environments and of 'context' more generally.

To do this we took a novel or at least an unusual methodological approach. Although performativity in schools and neoliberalism in education are often critiqued, this is generally on the basis of either theoretical and philosophical argument or typically small-scale qualitative studies. In this paper, we have drawn on a mixed methods study to understand how these social forces and tendencies influence engagement in professional development. The MRP example identified a variety of influencing factors. Yet these phenomena can be easily quantified as variables, thus indicating that qualitative research cannot be subsumed easily into an RCT methodology. Crossing paradigmatic boundaries, the analysis demonstrates the power of combining RCTs and IPEs with other methodologies, in this instance case study research. The analysis moved through a cyclical process where data were considered in relationship to explanatory social theory, specifically the theoretical constructs of capital, figured worlds and coupling. We have aimed to combine rigorous methodology and sophisticated theoretical work to yield analytically generalisable outcomes via a process of theoretical abstraction in a way that is, we contend, rare in the field. This approach has demonstrated the power of taking a theoretically-informed approach rather than the arguably atheoretical conception of the social world found in quasi-experimental paradigms.

The analysis showed that different levels of engagement in the Multiplicative Reasoning Project can in part be explained by the interaction of the following enmeshed features: (i) the positioning of the schools in terms of advantage and disadvantage - these positions in turn are rooted in their economic, cultural, social and symbolic capital; (ii) the schools' orientations to the performativity regime; and (iii) the schools' orientations to the learning activity system, in other words the alignment or dissonance between the schools' pedagogical and CPD cultures (figured worlds) and the CPD/change programme. The teachers' orientation to the learning activity system has previously been recognised in systems perspectives on professional learning (Opfer and Pedder, 2011) but we extended this to consider wider system relationships and, in this case, the English performativity systems. In schools and departments which were more closely coupled to the performativity system, what were considered legitimate outcomes were restricted. However, the experiences of restriction and coupling were both influenced by the positioning of the teachers and schools in terms of relative degrees of systemic privilege or disadvantage. The case studies indicate that, performativity aside, both the systemic perspective and the concept of figured worlds provide analytical tools for understanding variation in engagement and outcomes. The MRP analysis also highlights a further concern, at least in England: the relative disregard in policy for the importance of situation and wider systemic influences, experienced as 'context', in variously enabling or constraining teachers'

engagement and so the potential for learning. There are then contradictions between different aspects of government policy: marketisation leading to hierarchy and different levels of school capital and an encouragement for schools to lead professional development and system change.

It is not only in research literature that the nature of context is under-examined. Designers, instigators and funders of professional development activities including policymakers, at least in England, pay scant attention to how the 'local' ecosystems not only mediate the extent to which professional learning occurs but also shape what it means and what it is for. Similarly, there needs to be greater scrutiny of the ways that performativity systems impact on professional development. This has implications for the effectiveness of professional development initiatives such as the one considered in this paper - the Multiplicative Reasoning Project.

Ironically, the stress of standards, accountability, continual improvement and 'what works', which leads policymakers to fund professional development programmes, also can serve to undermine professional learning. Finding ways to overcome this problem is critical, given the scale of financial investment in professional development and innovation. The study presented here brings insights which can inform this endeavour as well as inform future research on participation in professional development innovations.

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